Accredited Standards Committee
X3, Information Processing Systems

Doc: X3T10.1/96a113r3
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Project: X3T10.1 / 1147
Ref Doc.: SSA-TL2
Reply to: John Scheible

To: X3T10.1 Membership
From: John Scheible

Subject: Simple speed negotiation proposal

PROPOSAL

The proposal changes SSA-TL2 as follows.

1) Figure 15 "State transitions" - replace the arrow description from Disabled to Enabled states that is currently labeled "Beginning Communication process" to "Speed Negotiation process". Add a new arrow from Enabled back to Disabled state with a label of "Speed Negotiation process".

2) Modify 9.3 Beginning Communications" as shown on the next page (with revision marks).

3) Add new sections 9.4, 9.4.1, 9.4.2 on speed negotiation as shown on the next page.

4) Modify 11.2.3 (CONFIGURE PORT SMS) as shown on the following pages with revision marks to allow for a Speed Re-negotiation function. Total Reset affects both ports and is more disruptive that this new function.

5) Add a new entry into Table 25 (ALERT CODE values) under the Warning type with an ALERT CODE field value of 060500h, a description of PORT OPERATING AT SLOWER THAN OPTIMAL SPEED and a port mode column of Unchanged.

Sincerely,

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9.3 Beginning Communication process

A port is in the Disabled state and Privileged mode after the following conditions:

a) POST;

b) a Total Reset Control frame is processed;

c) an Absolute Reset Control frame is processed;

d) the Link ERP process exits with an ALERT CODE value;

e) or a CONFIGURE PORT SMS is received with a non-zero NEGOTIATE SPEED field.

The port shall then use the following procedure to begin communication.

1) If the line fault detector indicates a line fault, then wait until there is no line fault. A line fault indicates that the remote node is not powered-on or that the cable is disconnected.

2) Invoke the Speed Negotiation process

3) Set the port's OPERATIONAL FLAG.

4) Wait for at least 10 FLAG characters to be sent.

5) Ensure that buffer space is available to receive at least 1 frame of any type. Then send an RR character pair and clear the RR PENDING FLAG (see 8.4.2.)

6) Wait to receive an RR character pair from the remote port. Then clear the WAITING FOR RR FLAG.

Privileged frames are now able to be received and transmitted.

9.4 Speed Negotiation process

The Speed Negotiation process is exited whenever synchronization is achieved and a FLAG character is received (when the port enters the Ready state). The speed Negotiation process can be broken down into two versions, single speed and dual speed.

9.4.1 Single Speed

The Speed Negotiation process for single speed devices sends at least 200 DIS characters to allow the remote port to synchronize prior to potentially forwarding a Control frame and then sends FLAG characters indefinitely until synchronization is achieved and a FLAG character is decoded.

1) Transmit at least 200 DIS characters.

2) Put the port into the Enabled state.

3) Wait until the port enters the Ready State.

9.4.2 Dual Speed

The Speed Negotiation process for dual speed devices attempts to synchronize at 400 MHz for 400 μsec, then at 200 MHz for 200 μsec, then at 400 MHz for 100 μsec, then at 200 MHz for 300 μsec then repeats the sequence indefinitely. At each speed, the process sends at least 200 DIS characters to allow the remote port to synchronize prior to possibly forwarding a Control frame. There is a 10% tolerance to the numbers to allow firmware implementation rather than forcing hardware implementation.

> Implementer's note 1: Implementers should minimize the tolerance, since a large tolerance increases the chances of synchronizing to a slower than optimal speed.

The following process is repeated indefinitely until character synchronization is achieved.

1) Set the transmitter to operate at 400 MHz and place the port in the Disabled state. Set a timer to time-out at 400 μsec +/- 10%. Transmit at least 200 DIS characters.

2) If character synchronization is achieved the port enters the Ready state changing the DIS characters to FLAG characters.. A control frame can now be forwarded. Then if a FLAG character is decoded prior to the timer expiring, exit the Speed Negotiation process.

3) Set the transmitter to operate at 200 MHz and place the port in the Disabled state. Set a timer to time-out at 200 μsec +/- 10%. Transmit at least 200 DIS characters.

4) If character synchronization is achieved the port enters the Ready state changing the DIS characters to FLAG characters.. A control frame can now be forwarded. Then if a FLAG character is decoded prior to the timer expiring, exit the Speed Negotiation process.

5) Set the transmitter to operate at 400 MHz and place the port in the Disabled state. Set a timer to time-out at 100 μsec +/- 10%. Transmit at least 200 DIS characters.

6) If character synchronization is achieved the port enters the Ready state changing the DIS characters to FLAG characters.. A control frame can now be forwarded. Then if a FLAG character is decoded prior to the timer expiring, exit the Speed Negotiation process.

7) Set the transmitter to operate at 200 MHz and place the port in the Disabled state. Set a timer to time-out at 300 μsec +/- 10%. Transmit at least 200 DIS characters.

8) If character synchronization is achieved the port enters the Ready state changing the DIS characters to FLAG characters.. A control frame can now be forwarded. Then if a FLAG character is decoded prior to the timer expiring, exit the Speed Negotiation process.

9) Return to bullet item 1).

11.2.3 CONFIGURE PORT SMS

The CONFIGURE PORT SMS defined in Table 28 is sent by the Master to each port on every other node in the Web during the configuration process. The Master also issues a CONFIGURE PORT SMS to return a port to Normal mode after it has processed an Asynchronous Alert that placed the port in the Privileged mode. In both cases the destination node returns a RESPONSE SMS.

Table 28 - CONFIGURE PORT SMS

Byte	Bit 7	6	5	4	3	2	1	Bit 0
0	SMS CODE (02h)							
1	PORT							
2	TAG							
3	TAG							
4	RETURN PATH							
5	RETURN PATH							
6	RETURN PATH							
7	RETURN PATH							
8	reserved							
9	A QUOTA							
10	B QUOTA							
11	EUDC	REFLECT	MODE		reserved			
12	reserved							
13	ALARM THRESHOLD							
14	ALARM THRESHOLD							
15	NEGOTIATE SPEED							
16	NEGOTIATE SPEED							

A CONFIGURE PORT SMS specifies the return path and the tag to be used when a node sends the Master an ASYNC ALERT SMS. It also establishes the operating parameters of the port.

The PORT field identifies the port that is being configured.

The TAG field is returned in the RESPONSE SMS. The same tag is also used in an ASYNC ALERT SMS if the node subsequently reports an Asynchronous Alert.

The TAG value is assigned by the Master and shall be unique among the TAG values used by other ports in the Web as indicated by the Master Asynchronous Alert table (see 9.2.2). The receipt of the resulting

RESPONSE SMS shall release the TAG value for use by SMSs other than the CONFIGURE PORT SMS, and the tag value shall no longer be considered active.

The RETURN PATH field specifies the path component that shall be placed in the address field of the resulting RESPONSE SMS and any subsequent Asynchronous Alert.

The A QUOTA field specifies the frame quota that a node is allowed to originate before it is satisfied. The value of the A QUOTA field shall be greater than zero.

The B QUOTA field specifies the maximum frame quota that a node is allowed to originate for each rotation of the SAT token. The value of the B QUOTA field shall be greater than or equal to the value of the A QUOTA field. If the B QUOTA value is less than the A QUOTA value, then the CONFIGURE PORT SMS shall be ignored and a RESPONSE SMS generated to the Configutor node issuing the CONFIGURE PORT SMS with the appropriate TAG value and a RETURN CODE of INVALID FIELD.

The EUDC bit (Enable User Defined Characters) specifies how the port handles User Defined characters. If the EUDC bit is cleared, the port shall not originate, nor forward any user defined characters from any other port of the node. If the EUDC bit is set, the port is allowed to originate user defined characters, and to forward user defined characters from other ports of the node that also have their respective EUDC bit set.

The REFLECT bit is one of the controls affecting the REFLECTION FLAG node function (see 9.2.6). If the node is a dual port node and the REFLECT bit is set, the REFLECTION FLAG is set for the node. If the node is a dual port node with the OPERATIONAL FLAG set for both ports and the REFLECT bit is cleared, the REFLECTION FLAG is cleared for the node. The REFLECT bit shall be ignored for single port nodes or switch nodes.

The MODE field selects the port mode as defined in Table 29.

Table 29 - MODE field values

Value	Description
00b	NO CHANGE TO THE CURRENT MODE.
01b	SET WRAP MODE.
10b	SET NORMAL MODE.
11b	SET PRIVILEGED MODE.

If a node receives a CONFIGURE PORT SMS with MODE field value of NO CHANGE TO THE CURRENT MODE and the specified port has an Asynchronous Alert pending then it shall send all pending ASYNC ALERT to the Master before sending the RESPONSE SMS for the CONFIGURE PORT. A MODE field value of SET WRAP MODE sets the Wrap mode and is only valid if the node received the CONFIGURE PORT SMS via a different port than that being configured. Otherwise the node returns a RESPONSE SMS with RETURN CODE VALUE of INVALID FIELD and the port mode is unchanged. When a port enters the Wrap mode, the port also becomes not Operational (see 9.1.4.3). Once a port has been placed in Wrap mode, the Master causes the node to exit the Wrap mode on the port by sending a CONFIGURE PORT SMS via a different port with a mode field value of SET PRIVILEGED MODE. The port shall exit the Wrap mode and invoke the Beginning Communication process (see 9.4). If a port currently configured in Wrap mode receives a CONFIGURE PORT SMS via a different port with a mode field value of SET NORMAL MODE, the node returns with a RESPONSE SMS with RETURN CODE VALUE of INVALID FIELD and the port remains in the Wrap mode.

The ALARM THRESHOLD field specifies the number of times the Link ERP process is invoked before the Asynchronous Alert process is invoked with an ALERT CODE value of ALARM THRESHOLD EXCEEDED. An ALARM THRESHOLD field set to zero disables the alarm threshold function. When the LINK ERP COUNTER = ALARM THRESHOLD value the node shall issue an Asynchronous Alert. Subsequent increments to the LINK ERP COUNTER above the ALARM THRESHOLD value shall not invoke the Asynchronous Alert process. If a valid QUERY PORT SMS is received with the CLE flag set, the specified port shall set the LINK ERP COUNTER to zero and thereby restart the alarm threshold function (see 11.2.8).

The NEGOTIATE SPEED field defined in Table 30 indicates what speeds the port should use when speed negotiating during the Beginning Communication process (see 9.3). The changes to speed negotiation caused by the state of the NEG40 and NEG20 flags is defined in Table 31. If a port is instructed to operate at only 20 MB/sec or to operate at only 40 MB/sec, then the node behaves as a single speed device (see 9.4.1).

Table 30 - NEGOTIATE SPEED field

Byte	Bit 7	6	5	4	3	2	1	Bit 0
15	reserved							
16	reserved						NEG40	NEG20

Table 31 - NEGOTIATE SPEED field effects on speed negotiation

NEG40	NEG20	Speeds to be negotiated
Cleared	Cleared	No change to speed negotiation
Cleared	Set	Speed negotiate only at 20 MB/sec
Set	Cleared	Speed negotiate only at 40 MB/sec
Set	Set	Speed negotiate at both 40 MB/sec and at 20 MB/sec

A port only saves the parameters of the most-recent CONFIGURE PORT that it has received.

The acknowledgment for the CONFIGURE PORT SMS is the receipt of a RESPONSE SMS with the same TAG value as was used for the CONFIGURE PORT SMS. The RETURN CODE field of the RESPONSE SMS shall indicate whether or not the CONFIGURE PORT was processed successfully (see 11.2.14).

Following the generation of a RESPONSE SMS for the CONFIGURE PORT SMS, a port that is running at 20 M/sec but is capable of running at both 40 MB/sec and 20 MB/sec shall invoke the Asynchronous alert process with an ALERT CODE value of PORT OPERATING AT SLOWER THAN OPTIMAL SPEED.